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ABSTRACT

In this monograph, the author discusses eight propositions derived from research which support the contention that, to adequately measure student performance, research designs must be capable of measuring multiple outcomes simultaneously. The first proposition deals with this need to measure multiple outcomes. The second proposition states that students affect teacher behavior, just as teachers affect student behavior. Proposition 3 concerns cultural differences in the dynamics of learning and states that no single teaching style works equally well with all of these differences. Proposition 4 deals with the interaction of social class with instruction, in particular, the large learning gap between middle-class and working-class children. The fifth proposition states that the emotional adjustment of students often has a powerful effect on their learning. Proposition 6 presents the need for a logical model that examines the interacting effects of teaching strategies and student characteristics on multiple outcomes of instruction. In proposition 7, it is stated that the most effective learning system is one which identifies and addresses each student's particular intellectual and emotional needs. Proposition 8 states that the most difficult step is putting a revised system into practice. In a final section, research needs in the area of student teacher interaction are discussed. (RC)

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Foreword

There are many ways that one can approach the idea of student/teacher interaction. There is an "ideal world" level to the concept--productive student/teacher interaction is, after all, the basis for education. This world is, sadly, primarily the domain of fiction and films, where Mr. Chips or Miss Dove knows by intuition exactly the right way to deal with each particular student. Then, there is a level where student/teacher interaction becomes a phrase to engender educational theory and practice about just what makes education work--theories and research that often remain unknown to teachers in the classroom.* Then, there is a more realistic level that shows that student/teacher interaction can produce generally negative effects--as indicated in a recent article demonstrating how a teacher's comments on a student's composition actually served to inhibit her creativity.**

In this sixth in our series of SCIPs (Special Current Issues Publications), Robert F. Peck of the R&D Center for Teacher Education at the University of Texas, deals briefly with the "ideal world" of student/teacher interaction but then develops a comprehensive discussion of the topic framed around eight research and practice-supported propositions. The paper serves as a fine introduction of the many levels of the topic.

The Clearinghouse is grateful to Dr. Peck for his contribution to this series. This paper was originally presented in another form at the National Invitation Conference on Research on Teacher Effects: An Examination by Policy Makers and Researchers, at the University of Texas at Austin, November 3-5, 1975. The original conference paper is also presented, in a greatly abbreviated form, in the Spring 1976 Journal of Teacher Education, along with all the papers from that conference.

--Joost Yff
Clearinghouse Director

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* Patricia Brown, "From the ERIC Clearinghouse on Teacher Education, Educational Research and Practice: A Literature Review," Journal of Teacher Education (Spring 1976)

** Charles Suhor, "Linda's Rewrite," Learning (August/September 1975), p. 20.

Different students react differently to different kinds of teaching; this is accepted by almost everyone as a self-evident truism. In recent years, major systems of instruction have been developed to try to take this truism into account: Individually Guided Education, Individually Prescribed Instruction, Personalized Teacher Education, Keller's Self-Paced Method, and others.

Even these systems involve much more art than science. They rely almost entirely on intuitive teacher judgments, or on untested assumptions about what works best for whom, for there is very little research-based evidence, as yet, about what is most effective for different kinds of students. Indeed, as we have grappled with this issue at The University of Texas R&D Center over the years, we have found that the statistical technology has not yet been developed to identify accurately the different effects of instruction on different students when even as few as two kinds of learning outcomes need to be considered. (Needless to say, we are currently devoting considerable effort to developing such procedures.)

As Cronbach (1975a) pointed out, a simplistic search for "general laws" of human behavior is almost certainly either useless or incorrect at this stage of our knowledge. What is needed are studies that would allow us to say, for example, that instructional method X will produce intellectual progress for student type A, while maintaining his/her interest in further learning; whereas method Y will maintain interest but not promote much learning; while method Z will promote learning but kill interest. At the same time, student type B may learn enthusiastically from method Y, not learn as much from method X, and will have both learning and interest killed by method Z. In short, what is needed is research that reasonably reflects the multivariate nature of real-life learning and the interacting effects of teacher and learner characteristics as they affect important outcomes of education.

There follow eight propositions, with brief illustrations which have some support in research evidence.

PROPOSITION ONE: THE NEED TO MEASURE MULTIPLE OUTCOMES

In order to design education that promotes student learning without causing undesirable side-effects, it is necessary to evaluate several major outcomes simultaneously. These outcomes include such things as subject-matter mastery, coping skill in handling problems resourcefully, development of steady work habits, sustained interest in further learning, and realistic self-respect.

Evidence for this proposition comes from a study of teachers whose successive classes over three years showed a consistent level of low, average, or high gain in standardized achievement scores (Brophy 1973). Substantial reversals are found in the relationships among pupil-achievement gains, pupil evaluations of teacher affective impact on them, and teacher self-reported feelings of personal adequacy. Those teachers whose pupils make the greatest standardized test gains also

tend to be least liked by pupils for the way they make the pupils feel about themselves (the correlation with MAT gain-score is -.44) and for the low interest value of their classes (-.52) (Peck and Veldman 1973).

Correlations between pupil gain-scores and teacher self-reports of personal characteristics show a similar, negative relationship. For example, teacher self-rated "idealism" and "attractiveness" scores correlate -.56 and -.49 with pupils gains on the Metropolitan Achievement Test average score. Teacher feelings about work, about parents, and about the future correlate -.30, -.53 and -.50 with pupil gain scores. A general self-concept score for teachers correlates -.59 with pupil gain. In short, in this study (Peck and Veldman 1973), pupil gain in standardized achievement scores is accompanied by negative pupil attitudes about the way their teachers treat them. Furthermore, the higher the level of pupil gain, the less the teacher expresses self-esteem or a sense of taking control of his/her own life. Similar results are reported in a study just completed by Manatt, Engel, and Netusil (1975).

Although it seems most unlikely that so strongly negative a relationship would be found between cognitive and affective outcomes in a large, representative sample of the nation's classrooms, the very fact that it occurs even once, as in this study, emphasizes how necessary it is to look at both cognitive and affective outcomes whenever we want to evaluate the "effectiveness" of the teachers or of an educational program.

Which outcome should we select to decide what kind of teaching is "most effective:" standardized test-scores, the effect on student self-esteem, or student feelings about school? Just posing the question indicates how nonsensically over-simplified it is to look at only one effect of a year's instruction. We certainly want children to learn each year; but we also want them to keep wanting to learn in future years. Their feelings about school are just as important as their short-term learning, insofar as such feelings are likely to influence their long-term learning. Stallings' study of Follow-Through programs (1975) found that drill and teacher pressure for results led to greater achievement test gains, but poorer attendance; while "open, flexible" teaching had the opposite effects. Both Berliner (1975) and Borich (1976) emphasize the need for research that looks simultaneously at several kinds of outcomes.

PROPOSITION TWO:
THE RECIPROCITY OF TEACHER-STUDENT INTERACTIONS

Students affect teacher behavior, just as teachers affect student behavior. This is illustrated by a current study (Evertson, Brophy, et al. 1975) in which second through fifth-grade students have been ranked consistently on a number of traits by two successive teachers. Thereafter, their interactions with their teachers have been observed and coded. Here are some of the findings.

Students who rank high on "looks you in the eye" and "happy" receive high rates of response opportunities. They also volunteer more

answers in small groups and in class discussions. Students seen as "standing out" get many response opportunities in class. They call out their answers more often and tend to be criticized more for their eagerness. "Standouts" receive a high proportion of behavior contacts from the teacher, including both praise for good behavior and threats or criticisms for misbehavior.

At the other extreme, students seen as "hardly noticeable" are called on more often by the teacher for small group response opportunities. They are called on more (without volunteering) in general class discussion, as well. They are praised more when they do volunteer, however. They also initiate more work contacts with teachers, and teachers initiate more contacts with them. They receive more praise for work and generally more positive reactions from the teachers.

"Happy" students get more behavioral praise, more response opportunities, more positively reinforcing teacher contacts, and a higher proportion of classroom housekeeping jobs. Students seen as "unhappy" do more handwaving or eager volunteering in small groups but are called on less often. They receive more private work contacts and have more behavior contacts of a negative nature. "Unhappy" students also sass or defy the teachers more and have more disciplinary contacts followed by warnings and threats. They receive more praise for good work and more criticism for poor work.

There is independent evidence from other parts of this research program, known as the Student Attribute Study, that the teachers are responding to real properties of the different students, not just pursuing a self-fulfilling prophecy. This research follows a line of work initiated by Brophy and Good (1974), which has repeatedly demonstrated ways in which student behavior tends to affect teacher behavior, just as teacher behavior often shapes student behavior. This is one of the relatively rare examples of research on the reciprocal interactions that constitute and explain the learning process.

PROPOSITION THREE:
CULTURAL DIFFERENCES IN THE DYNAMICS OF LEARNING

There are important differences in the dynamics of the learning process among students of different cultures. No single style of teaching works equally well with all of them. This proposition can be illustrated with findings from the first year of the Teaching-Learning Interaction Study (Peck 1976). Black sixth graders in integrated classrooms who are rated low by their peers at the year's start for working hard and for getting along with people in school, actually lose considerable knowledge over the year, as measured by a standardized test of subject matter mastery. Conversely, Blacks who are rated high at the outset perform at year's end as their initial test scores would have predicted. They do not lose ground in their knowledge of subject matter. The pattern for Mexican-American children is similar, except that those rated low on their orientation towards school do not

lose as much ground as do unadjusted Blacks. This differential pattern does not show up among Anglo children in the same classrooms. They gain about what their pretest scores would predict, no matter what their initial peer rating on school orientation.

Looking at a different but equally important kind of outcome, the self-esteem of Black children is strongly affected by their teachers' own level of self-esteem in a way that does not hold true for their Anglo or Mexican-American classmates. Black children who are rated low on emotional adjustment by their peers in October show a large loss in self-esteem by April if their teacher scores relatively low in self-esteem. Even with teachers who express average or high self-esteem, the low-rated Black children show a moderate loss in self-esteem over the year.* Highly adjusted Black children, on the other hand, show much less vulnerability to the negative effect of a teacher with low self-esteem. Even they are more susceptible to teacher influence than children in the other ethnic groups, however, for they show a strong gain in self-esteem when placed with teachers who show high self-esteem.

Anglo children's self-esteem is not influenced much by teacher self-esteem, except for a moderate gain when placed with highly self-esteemed teachers. Mexican-American children's self-esteem is not much influenced by teacher self-esteem, either; but their beginning-of-the-year emotional adjustment has a strong effort. Those rated least adjusted in October show a marked loss in self-esteem over the year; those rated well-adjusted show positive gains in self-esteem, whether teacher self-esteem is high or low.

Thus, each child's initial emotional adjustment and each teacher's level of self-esteem interact in a different way for Black, Mexican-American, and Anglo-American children in the same classrooms. There is a uniquely different set of effects on the children in each of these ethnic groups.

Still another finding illustrates the fallacy of assuming that a goodsounding style of teaching is always good for all students. One of Ryans' major factors, measured by direct observation of teacher classroom behavior, is "Stimulating, Inventive" (Ryans 1960). While this teaching pattern is associated with greater-than-expected gain in achievement scores for a certain kind of student (those rated high on emotional adjustment), it is associated with a moderate loss in achievement scores among students who are low on emotional adjustment. (See the cautionary note at the end of Proposition Six.)

There is also an important cultural difference. Teachers with a high score for stimulating, inventive teaching show a strong, unexpectedly negative effect on the self-esteem of Black students. Indeed, even

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* Fifty percent of the Black children in this study were rated by their classmates in the lowest third of the total school population on emotional adjustment; this is quite unlike the even distribution along the scale of Anglo and Mexican-American children.

teachers who are average in this respect have a slightly negative effect on the self-esteem of Black students.

No such effects are visible on the self-esteem of Anglo students. Mexican-American students show a slightly positive gain with highly stimulating teachers and slight losses with teachers who are average or low on this characteristic.

It looks as if Black children may all too easily feel overwhelmed and increasingly inferior when placed with a teacher who is lively, dynamic, and has many ideas. This is certainly an unintended effect, for most teachers who are rated high on this dimension are not dogmatic, egotistical, or overweening; they are just being themselves when they generate ideas. Indeed, they would not be rated high if they were not trying hard and successfully to think of ways to spark student interest or to meet special needs of their students. Nonetheless, if this finding holds up in the replication study which is now in progress, it will furrow the brow of some of our best teachers and their administrators to figure out ways to keep the advantages of this style of teaching but to forestall the unexpectedly deleterious effects on Black students.

PROPOSITION FOUR:
THE INTERACTION OF SOCIAL CLASS WITH INSTRUCTION

A crucial, worldwide challenge is to invent educational strategies that will reduce the very large learning gap between middle-class and working-class children. In a ten-year, cross-national study, "Coping Styles and Achievement," carried out in eight countries (Brazil, England, Germany, Italy, Japan, Mexico, the United States, and Yugoslavia) the most outstanding finding is not one of national or sex or age differences, but the large, systematic deficit in all countries in educational achievement of skilled working-class youth compared with upper-middle-class youth at ten and fourteen years of age (Peck, et al. 1972; Peck, et al. 1973). What is more, the working-class youth in most of the countries show many parallel deficits in coping skills and in self-esteem. As might be expected, numerous interaction effects are observable with such factors as class, age, and sex.

The socioeconomic differences are actually underestimates of the true discrepancy. For example, at least fifteen to twenty percent of the Anglo, ten-year-old, working-class children in school in Texas proved to be functionally illiterate and had to be excluded from the sample used in this cross-national study. Furthermore, many of the academically least effective students in most countries had dropped out of school by age fourteen.

Since it is all too well established that children from the lowest socioeconomic status (SES) level (who were not included in this study) show even poorer academic achievement in all countries, the conclusion is inescapable that none of these countries has found an effective way to educate the children from the lower sixty to

seventy-five percent of its population. This finding parallels the findings from the International Study of Educational Achievement (Husen, et al. 1967; Husen 1972), the Coleman report (1966), Jencks, et al. (1972), and many other studies (e.g., Bryant, et al. 1974). Standard schooling works very differently for these children than for middle-class children. In the United States, this means that the children from the lower half of the socioeconomic range (at least sixty-five percent of the elementary school population) are much less likely to master the standard academic skills than are their middle-class schoolmates. There is, in short, a powerful "interaction effect" whereby the absence of a differentiated treatment produces this large inequality of educational outcomes.

Tyler (1951) proposed that this deficit might be made up by providing lower-class children with some of the practice that middle-class children get outside of school. Merely adding more hours to the school day, with the same instructional procedures, probably would not get to the heart of the problem. Brophy and Evertson (1975) report systematic differences in teaching techniques that produce achievement-test gain with young students of low and high socioeconomic status. Stallings' report (1975) contains perhaps the largest, most solid body of evidence ever assembled which bears on this issue.

Perhaps another, crucial key to the problem comes from the evidence of important social class differences in parental example (Marjoribanks 1971) and in parental "teaching techniques" (Blau 1972; Greenberg and Davidson 1972; Kohn 1969). A number of pilot programs have been mounted in the past decade by school systems and by state education agencies for the purpose of innovation. Some of them reach out to involve lower-class parents much more actively and continuously in the schooling process; some, to provide new kinds of training for parents which help them teach their children coping skills that give them a better preparation for school. All of this together, if it were tested, systematized, and made a permanent part of our educational system (in the broadest sense of that term), might substantially improve the motivation, the coping skills, and the academic achievement of our undereducated majority.

PROPOSITION FIVE:
THE INTERACTION OF AFFECTIVE AND COGNITIVE FACTORS

The emotional adjustment of students often has a powerful effect on their learning. Many of the findings used to illustrate Proposition Three also illustrate this proposition, with the caution noted below. Some other findings from that study (Peck 1976) illustrate the influence of emotional adjustment on cognitive performance in ways that would not be changed by reanalysis. For example, sixth graders who score high on a pre-test of academic achievement make better than expected scores on the achievement post-test if they also are rated high on emotional adjustment by peers at the beginning of the year.

They neither gain ground nor lose it if they are average or low in emotional adjustment. Students who score average on the achievement pre-test score lower than expected on the post-test if their emotional adjustment is average or low. Students whose beginning achievement level is low similarly lose a little ground over the year in their academic achievement if their emotional adjustment is low. Looking at it the other way, students who are in good mental health gain ground over the year in their knowledge of subject-matter compared to the total sixth-grade population if they start the year at an average or better level of achievement. Students whose adjustment is relatively poor and whose mastery of subject-matter is poor or even average to begin with lose ground during the sixth grade. They fall even farther behind the other students than they were at the beginning of the year.

Incidentally, these very sizable differences in outcome are all the more striking when one considers that the particular test that was selected by the school staff as an achievement measure, the McGraw-Hill Comprehensive Test of Basic Skills (CTBS), shows extremely little change in mean item scores during the sixth grade. This is true not only in the population in this study, but in the CTBS national standardization sample. The typical gain on a 38 or 40-item sub-test is only one or one-and-a-half items.

Furthermore, there are no systematic "main effects" for the different teachers. Teacher characteristics do appear to bring about real gains or losses, but only in ways that have different effects on different kinds of students. Moreover, our initial analysis indicates with respect to the affective side of learning that teacher feelings have a definite impact on student feelings in numerous ways.

PROPOSITION SIX:
THE NEED FOR THE INTERACTION PARADIGM IN RESEARCH ON LEARNING

To study each of these problems, and to design more effective schooling, requires a logical model that examines the interacting effects of teaching strategies and student characteristics on multiple outcomes of instruction. In each of the studies cited above, the use of an interaction paradigm has demonstrated that learning outcomes can only be explained as the result of an interplay of forces. Studies that fail to allow such interactions to be measured simply cannot arrive at an accurate map of the complex world of everyday learning. There are problems aplenty in this approach. Even in the course of updating his argument for a multivariate approach to the study of behavior, Cronbach (1975a, 1975b, and in personal communication) points to troublesome limitations in our best, present quantitative methods for handling such issues. Nonetheless, he sees almost no validity at all in more simplistic approaches that ignore interaction effects, curvilinearity, or other evidence which indicates that not all people react the same way.

Cronback has just completed a new, 178-page monograph (Cronbach 1975b). In a recent letter to the author, Cronbach indicates that he

has found serious conceptual and statistical difficulties which must be overcome in any analysis which uses data on individual children, pooling classes.

As it happens, because the sixth grade learning centers in Austin are centralized schools with heterogeneous student populations, and because the teachers appear to be a representative sample of the total Austin teacher population, the findings reported here may not be affected by the problems Cronbach has discovered. Nonetheless, after studying the arguments in this new Cronbach monograph, we may reanalyze our data, taking account of the restrictions he believes may apply. The results of such a reanalysis would then be compared with the results from the analytic model by which the illustrations for Propositions Three and Five, above, were derived. If Cronbach's expectations are borne out in the reanalysis, some of the patterns cited in Propositions Three and Five may not be a correct statement of the facts although they may still prove to be correct. The ones that might be affected involve teacher X student interaction effects.

If Cronbach is right, though, most previous studies on Aptitude-Treatment-Interactions will have to be re-examined.

After closely observing the teachers and students in the Teaching-Learning Interaction Study for a year and a half, we are quite sure that there are important differences in the way different children react to different kinds of teaching. If it should turn out that one overall analysis of all classrooms should not be used, then we would have to look at one class at a time, and look for repetition of patterns across classes. This would probably involve more qualitative judgments of pattern similarity, and it would be harder to determine the exact size and significance of differences across classrooms. Of course, we may not have to do this if our sampling procedures prove to have been sturdy enough. Working at the outermost edge of the state of an art can be frustrating and time-consuming, but it also is unfailingly interesting.

Hunt (1975) presents a recent review of the evidence and the logic for what he calls the Person-Environment-Interaction (P.E.I.) paradigm. He proposes four essential elements for such a model: (a) that it look at multiple behavioral outcomes; (b) that it be "developmental" over some appreciable period of time; (c) that it look at the reciprocal interactions between person and environment; and (d) that it be "practical."

The series of studies cited here do look at multiple outcomes; they observe learning over a full year or two of schooling; one of them specifically focuses in detail on reciprocal interactions; and all attempt to be practical, both by looking at learning in its natural settings, in school (or in college: see Proposition Seven, below), and by assessing outcomes that are widely held to be important. These particular studies have grown out of the multidisciplinary tradition of the Committee on Human Development of the University of Chicago, represented by the work of such people as Havighurst, Warner, and Prescott. That tradition embodies the same debt to Kurt Lewin that Hunt acknowledges.

A considerable number of other studies have used some form of the interaction paradigm. As early as 1944, Thompson and Hunnicutt reported that "introverted" students performed better when praised by their teachers, whereas "extroverts" performed better when criticized by teachers for their mistakes. Heil (Washburne and Heil 1960) reported that teacher personality interacted with child personality to create differential learning in different types of children, with different patterns for different elementary school subjects.

Cronbach (1957) strongly recommended that an interaction paradigm be adopted as the best logical model for tracing educational effects to their actual causes because this better approximates the complex realities of everyday learning. Subsequently, quite a few studies attempted to embody this approach, although many of them used a very narrow definition of "aptitude-treatment interaction (ATI)." Moreover, according to Bracht (1970), "the analysis of an interaction effect was often an afterthought rather than a carefully planned part of an experiment." Nonetheless, Glass (in Wittrock and Wiley 1970) concluded, "ATI has not paid off."

On the other hand, Cronbach and Snow (1969) found that the interaction approach explained learning better than the single-predictor model. Lesser (1971) cited a substantial number of other studies in support of this approach. Berliner and Cahen (1973) did not find as powerful confirmation of the trait-treatment interaction model as they expected, but they did see hope for it in better-conceived studies. Koran (1971), reporting a study with numerous interaction effects, observed "as Cronbach and Gleser have suggested (1965), initial study of aptitude X treatment interactions will quite possibly be more important for what it tells us about the psychology of instruction than for immediate placement purposes. However, such experimentation may eventually help provide a basis for the individualization of instruction."

Britt (1971) described an intriguing, computerized method of identifying "learner types" which, from the defining statements, also specifies the characteristics of differentiated instructional programs that should optimize the learning of each "type." He did not, however, cite evidence of the observed effectiveness of such differential instruction in practice. Salomon (1971) reviewed a number studies that showed important ATI effects. His 1972 paper describes ways in which ATI can be turned into specifications for differential programs of instruction for different kinds of learners (Salomon 1972).

Studies reporting significant trait-treatment interaction effects that have not been cited in earlier reviews, include the following: Berliner 1972; Blitz and Smith 1973; Britt 1971; Brophy 1975; Cronbach and Snow 1969; Davis 1967; Dowaliby and Schumer 1973; Featherstone 1973; Fisher, 1973; Kress and Gropper 1966; Lippman 1970; Pervin 1968; Shores 1969; Smith, Wood, Downer, and Raygor 1956; Tallmadge and Shearer 1971; and Taylor 1970.

It is easy to sympathize with the critics of the P.E.I. approach. In struggling to use it in various action-research and pure research

studies here at the The University of Texas over the past twenty years, we have found that it is difficult and expensive to conceptualize this approach sharply, to instrument it soundly, to carry it out in practical settings, and to analyze it. Many of the necessary statistical procedures, for example, have only been developed into a complete, usable system within the past four or five years. Some of the key issues are not yet settled, as we have just seen. Nonetheless, every time we have used this approach it has proved out. Indeed, we are persuaded by now that it is every bit as essential to an accurate, insightful, useful analysis of human learning and human development as we initially supposed it might be.

One of the additional virtues of this multi-faceted way of trying to map reality is that it seems to prepare one to notice factors in the learning situation that were not foreseen in the initial formulation of a particular study. Perhaps anyone who studies people in real life settings has a better chance to notice such "extraneous" but crucial factors. The P.E.I. model seems to prepare the mind especially well to make such serendipitous discoveries.

PROPOSITION SEVEN:
THE INTERACTION PARADIGM IN THE DESIGN OF EDUCATION SYSTEMS

The most effective learning system is one which identifies and addresses each student's particular intellectual and emotional needs. One program that embodies the P.E.I. paradigm is the Personalized Teacher Education Program, in progress at The University of Texas at Austin since 1956 (Peck and Bown 1964; Peck 1970), first with Hogg Foundation and NIMH support, then with OE and NIE support through the R&D Center for Teacher Education. This program contains many of the elements described by Goldschmid and Goldschmid (1973), plus some unique processes such as personalized assessment feedback and performance feedback, carried on repeatedly by a multidisciplinary faculty team. Two successive examples of this program have been evaluated using an interaction model, one from 1962-67 (Peck 1962; Fuller, Peck, Bown, Menaker, White, and Veldman 1969; Menaker, Peck, and Veldman 1972); the other, in 1972-73 (Borich, Godbout, Peck, Kash, and Poynor 1974; Haak and Peck 1974).

Findings from the latter study illustrate both why an interaction model is essential in order to understand what goes on in any educational program, and why it is desirable to conduct education in a "personalized" way, deliberately differentiated on the P.E.I. model, if optimal outcomes are to be achieved. Among the findings are patterns such as these:

> Young women who start into student teaching with a high anxiety level but who attribute this to the adults they must deal with, not the children, and who actively seek and use feedback, end up being judged effective teachers. Women who fundamentally

fear and distrust adults, but who rather successfully conceal this through surface conformity and through defensively denying their problems, are judged ineffective by the end of student teaching.

A comparison of the Personalized Teacher Education Program with a conventional program verified the superiority of the personalized approach. It turned out that most students had a variable profile on such teaching-relevant characteristics as clarity of purpose, anxiety level, and attitude toward children. A student who was quite anxious profited more from personalized attention to reducing that anxiety than did an anxious student in conventional training. However, that same student may have started out with a very positive attitude toward children, which required no special attention in the course of training. Students who were above average in one characteristic to begin with, profited as much from conventional teacher education as from personalized training with respect to that one above-average characteristic. On the other hand, students profited more from a personalized program with respect to characteristics where they were relatively ineffective to begin with; and most students were below average on several characteristics.

The results indicate that entering status on any one characteristic cannot be used efficiently to assign people to a conventional or personalized program. The particular "learning needs profile" of each student teacher needs to be determined. Skillful, constructive attention needs to be given to those characteristics where the student is below par. The student can usually be left free to use his/her other characteristics without any special intervention. This, of course, is precisely what a personalized program does, and that conventional programs do not do to the same extent or with the same precision.

In both of the comparative evaluations of the outcomes of personalized versus conventional programs, the evidence indicates that instruction tailored to students' individual learning needs, affective as well as cognitive, produces more effective teachers than does a conventional, more group-oriented kind of instruction.

The same logic would seem to apply to the design of education at any age level. If, as has been demonstrated, different students need different treatments, and if affective elements are as important as cognitive elements, education at all levels will work better to the degree that it is both individualized and personalized through insightful attention to the personal values, needs, and behavior style of each individual, and through providing well-tailored, constructive human relationships as part of the teaching-learning process. The question is not whether it would be better to teach people in this way, but how it may be done with reasonable cost and with practical ways of insuring that it is kept working effectively.

PROPOSITION EIGHT: THE HARDEST STEP IS PUTTING A REVISED SYSTEM INTO GENERAL PRACTICE

Gene Hall's report addresses this issue with empirical data and with a conceptual system for identifying the stages through which people move if and as they adopt an educational innovation (Hall 1975). I will merely illustrate this point, which all of us know too well, with a sketch of some of the human and institutional obstacles we have encountered while helping teacher education institutions adopt or adapt major elements of the Personalized Teacher Education system.

If differentiated instruction is to be put into everyday practice, it turns out that some considerable changes have to be made in faculty role-assignments in order for such a program to cost no more than present methods of college instruction. For instance, a trained counselor needs to spend half or more of his/her time giving personalized assessment feedback and performance feedback to students rather than spend all of his/her "work-time" teaching courses in educational psychology. An expert in teaching methods needs to be freed from course work and paid to work with students in their "practice school," along the teaching center model, not spend most of his/her time on group instruction in a campus classroom. Some instructors need to be freed of direct instructional activities for at least half their time for several years in order to develop, test and, refine instructional modules that students can use according to Keller's Self-Paced, Proctored Instruction Model (which its practitioners have recently come to call "personalized instruction"). Furthermore, an interdisciplinary team of instructors needs to be created to plan instruction as a group and to work together frequently with students and with supervising teachers in the schools.

Changes such as these do not sound all that revolutionary to many teacher educators. Deep institutional resistance to such change does, however, exist. It is entrenched in regental or legislative rules about what constitutes reimbursable activities for professors. There is also the powerful inertia of the centuries-old example of what it means to "teach college," which individual professors have to overcome. Team teaching strikes some professors as a real and serious infringement on academic freedom. Some teachers may positively enjoy the limelight of the lectern; or they hate to give up the recognized advantages of delivering well-organized, thoroughly researched lectures to college classes in return for the unforeseeable, instantaneous demands of the "firing line" in public schools. There is, needless to say, a continuing place for effective group instruction, either at places within a personalized system or alongside of it.

The greatest barrier to this model of education is not primarily an economic one but rather the need for major social engineering if colleges of teacher education are to conduct themselves according to a different pattern. Merely demonstrating, through research, that a new system produces superior results is not nearly enough to achieve adoption of such a system. Such validity evidence is merely the starting

point for a long process of institutional change--if, indeed, change ever will occur. Hall's work offers some ideas and some useful tools that might facilitate such changes.

WHERE CAN WE GO FROM HERE?

1. First of all, we urgently need to develop more adequately complex logico-statistical models that validly correspond to the known complexity of the teaching-learning process. Such models simply have not been developed, as yet. To develop them requires research--not just theoretical work, but testing each new model with multivariate data on teachers, on students, and on the multiple outcome effects in the school setting.

2. We cannot and should not wait for years-distant success in this search for more sophisticated statistical models. While work proceeds on that front, a great deal can be accomplished by a program of studies that focuses microscopically on the teaching-learning effects that occur and the reasons why they occur in a number of subpopulations of students that are of major concern: fast and slow learners; children of different cultural backgrounds; boys and girls; children of the three or four major socioeconomic levels; and children with good and poor emotional adjustment.

The key word is program, for a comparative master design is essential if the methods and results from the study of one population are to be directly compared with those on the other populations. It is possible to use a kind of meta-logic that classifies the similarities and differences in the patterns found in different groups, with replication of each sub-study as a major test of the validity of the findings on that sub-group. No more than very simple sign-tests of pattern variation across groups may be possible; but that could tell us a lot more than we know now.

3. Part of the design should be the simultaneous assessment of several important outcomes in each population: subject mastery; coping skill; attitude toward further learning; and emotional adjustment. Decision-models will need to be developed and tested which would allow one to say what combination of teacher and learner characteristics appear to optimize learning for a given kind of student across all outcomes. Gain in one respect should not be achieved at too much cost in other respects. What constitutes "too much" and how much gain is "enough" need to be defined; or, rather, a method needs to be developed which presents these questions and the data to educators, to parents, to all who care about the effects of schooling. The method should include guidelines that will help any decision-maker state the issues clearly and see what is likely to happen in each outcome-area when one or another mix of educational methods is used with a given group of students. The final policy decision would remain with the people who care most about that group. The decision-making model should simplify, clarify, and objectify their work to a useful degree.

4. As soon as tested findings do emerge, the next step in the Research-Development-Dissemination process must come into play, if anything useful is to follow. The findings must be turned into clear, useful "how-to-do-it" materials for teachers, parent groups, school administrators, school boards, or other interested groups to use. Every such "manual" must be pilot-tested, field-tested, and rigorously evaluated. This is a lengthy, complex, and expensive process. Unless it is well done, though, and probably unless the original researchers take a leading part in it, little impact on educational practice can reasonably be expected.

5. Even after good training materials have been developed, we may be sure that they will win no instant, accurate adoption. A carefully planned, collaboratively managed, face-to-face adoption process has to be carried out between the research-developers and the ultimate users--all interested educationally-involved groups, but, most especially, teachers. Continuing inservice education unquestionably will need to be provided. Short, intensive workshops will have their place in this process, but the total program must probably be years-long, with more than a few days a year set aside from all the other duties which teachers face.

State departments of education have a central role to play in planning and supporting such work--by which token, they had best be brought in on the RD&D process from the very first steps in the planning of the research.

The teacher groups and local education agencies who will be participants in the research, participant-evaluators in the materials-development and testing, and the ultimate adopters of useful findings should likewise be co-equal partners in the enterprise from the beginning. At least, we have found that research is turned into educational practice a good deal more certainly and more enthusiastically if it is done this way.

It is likewise highly desirable to set up, from the outset, a parallel consortium of preservice teacher educators, teacher education programs, and the national associations of teacher education colleges as members of the planning-research-development and adoption community. Without restricting the field to our own model (the Personalized Teacher Education Program) the research on this example does suggest that personalizing and individualizing teacher education--preservice or inservice--is probably the most potent way for teachers to convince themselves to use this approach with their own students. Teacher education itself is a fertile ground for research that uses a multivariate, multiple-outcome interaction model.

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